

Measurement of Reactive Nitrogen in the Stratosphere.

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Simultaneous vertical profiles of NO , NO_2 , HNO_3 , HNO_4 , N_2O_5 , and ClNO_3 were measured at 35°N over the 20 - 39 km altitude range during a September 1993 balloon flight of the MkIV interferometer. We will illustrate the excellent agreement of the measured diurnal variations of NO , NO_2 , and $2 \times \text{N}_2\text{O}_5$ with predictions of a photochemical model, constrained by MkIV measurements of NO_y , Cl_y , and O_3 . Our results provide confidence that the photochemical model correctly reproduces: (1) the conversion of NO to NO_2 at sunset and (2) the decrease of $\text{NO}_x (= \text{NO} + \text{NO}_2)$ during nighttime through production of N_2O_5 .

Simultaneous observations of the suite of NO_y gases by MkIV during a series of balloon flights between 1990 and 1993, combined with aerosol surface area from SAGE II, allow us to probe the role of heterogeneous reactions of sulphate aerosols. The inclusion in the photochemical model of heterogeneous hydrolysis of N_2O_5 is sufficient to provide an excellent description of the observed non-linear dependence of NO_x/NO_y ratio on sulphate aerosol surface area. Since the saturation of NO_x/NO_y ratio limits the increase in ClO within the Cl_y reservoir, catastrophic loss of O_3 from enhanced sulphate aerosols is precluded for surface areas up to $14 \mu\text{m}^2/\text{cm}^3$. We will also show that heterogeneous hydrolysis of ClNO_3 , BrNO_3 , and reactions of HCl with sulphate aerosols play a minimal role in regulating NO_x for the observed mid-latitude stratosphere.

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4. A
5. (a) None
(1) 0340"
- Middle atmosphere
composition and chemistry
6. Oral Preferred
- 7.
8. 100% GRL (submitted)
9. Cheque Enclosed
10. C
- 11.
- 12.
- 13.